Block periodization

- The solution when planning training in a very busy work-schedule?

Paul André Solberg, PhD
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Main Principle of Training Planning

Tactical/operative training

Physical training

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The Worlds Most Stressful Job

(Forbes, 2013, 2014, 2016, 2017 and 2018)

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Problem 1): Continuity

- Total work load
- Sleep
- Travelling
- Family
- Equipment and availability

Program development – Athlete vs operator

Athletes:

- Known
- Specific
- Goal directed
- Controllable

Operators:

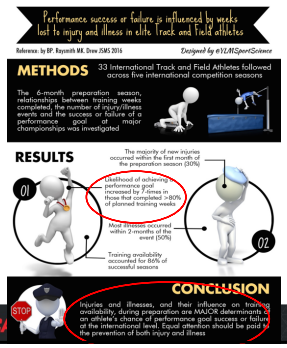
- Unknown
- Non-specific
- Uncontrollable
- Multiple areas

Woods, D.

Training and injuries

- Foot soldiers (Army): 50% of all injuries occurred during PT and 30% from running (Smith & Cashman, 2002).
- US Airborne SOF: 40% musculoskeletal and 22% happened during PT (Lynch & Pallis, 2008).
- US Army SOF: 25% musculoskeletal and 58% occurred during PT. Running primary cause (Abt et al., 2014).

The importance of staying healthy



Demand Analyses

- **Strength (ex. heavy gear)**
- **Endurance (ex. long walks)**
- Power (ex. fast movements)
- Flexibility (ex. awkward movements)
- Stability (ex. front loaded)

Kraemer & Szvivak, 2012

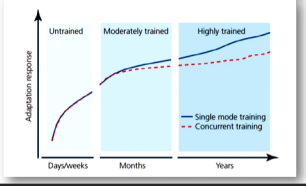
Problem 2: Concurrent training

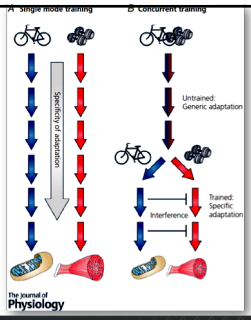
- Sabag et al. (2018): Small negative effect of concurrent HIIT and RT compared to RT alone on lower body strength (ES = -.25). Seemed to be effected by modality of HIIT (cycling: ES = -.38).
- Trivial effect on upper body (ES = 0.02)

Interference effect?

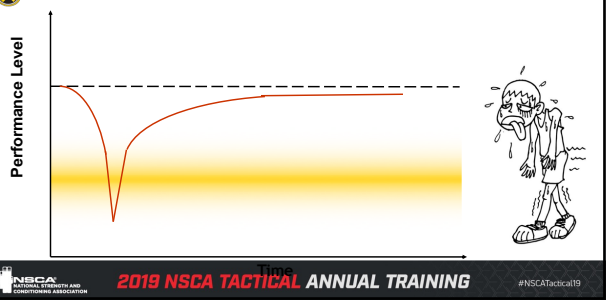
SYMPOSIUM REVIEW

Concurrent exercise training: do opposites distract?





Problem 3: Recovery



Periodization

- Definition: Planned manipulations of training variables (modality, volume, intensity) to maximize fitness adaptions, while minimizing risk of overtraining (Evans, 2019)
- Purpose: implement structured variability into training
- Ensure maximum performance at appropriate times

Fry et al., 1992

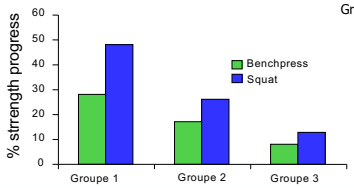
Usual organization of endurance or strength training

- Linear models (LP)
  - High volume and low intensity in the beginning with a gradual progress to lower volume and higher intensity
  - Often based on individual sports not team based (Manchado et al., 2018)
  - Require high levels in several capacities
  - Not much time to train an effective periodization of physical factors

Linear periodization

Benchpress, squat
2 sessions pr week; 12 weeks
Trained subjects

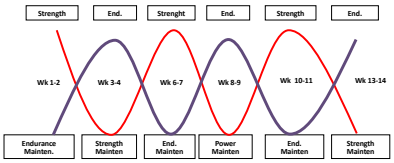
Groupe 1. (periodization)
4 uker: 5 x 10RM
4 uker: 4 x 5-7RM
4 uker: 3 x 3-5RM
Groupe 2. (control)
6 x 6-8RM
Groupe 3. (control)
5 x 10 (same load)



Willoughby et al., 1992

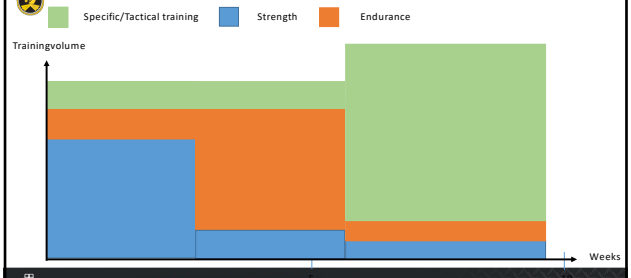
Better option: Block-Periodization?

Focuses on high consentration of stimulus on ONE or FEW characteristics



Issurin, 2010

Block periodization: Specific mesocycle blocks



Effect of Block-Periodization on endurance in well trained cyclists

- Usual organization of endurance training: 2 HIT (High intensity) sessions per week together with several sessions with low or moderate intensity (Sandbakk et al., 2016; Tønnesen et al., 2014)
- What is the effect if the amount of HIT is the same?

Rønnestad et al., 2016

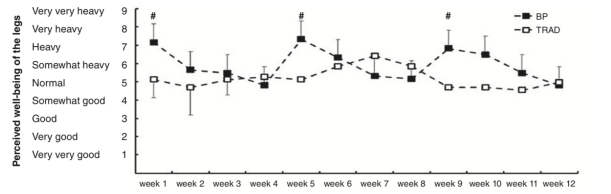
Block-Periodization in well trained cyclists cont.

Week	Block	Trad
1	5	2
2	1	2
3	1	2
4	1	2
5	5	2
6	1	2
7	1	2
8	1	2
9	5	2
10	1	2
11	1	2
12	1	2
Total	24	24

HIT:
6x5min all out
Or
5x6min all out

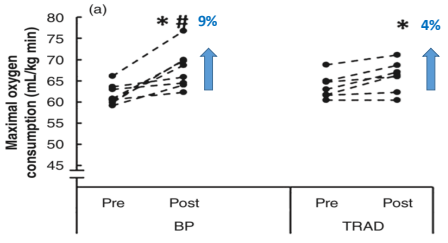
Rønnestad et al., 2016

Feeling in legs and volume

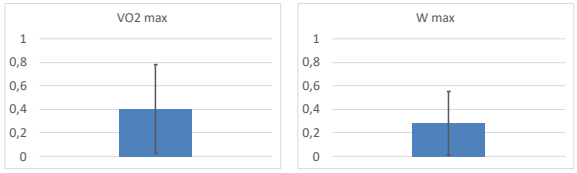


Rønnestad et al., 2016

Changes in VO_{2max}



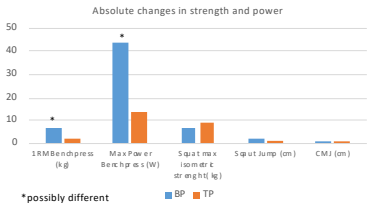
Meta-analyze of block training vs trad on endurance



Rønnestad, B (2019)

A comparison of traditional and block periodized strength training programs in trained athletes

- N=24, 15 weeks
- 4 sessions per week
- Similar volume



*possibly different

- Tests closer to training modality at the end of protocol for Block?

Bartolomei et al., 2014

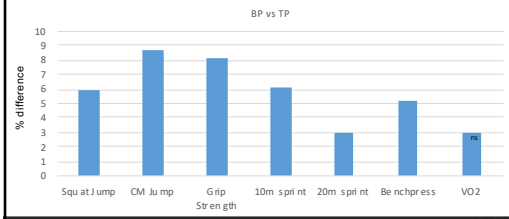
Strength gains: Block vs DUP weight training among track and field athletes

- DUP: Daily alterations in repetitions or Block
- 32 athletes (NCAA div I), 3d/wk for 10 weeks
- **Same gains, but difference in amount of improvement per volume load!! (Important for SOF).**
- BP → Higher training efficiency
- BP: RFD increased (less fatigue?)

Painter et al., 2012

Block on Female Elite Team Handball Players

- Trad (TP) vs Block (BP), 17 weeks, n=11 (over 2 conc seasons)
- VO2, sprint and throwong velocity



Manchado et al., 2018

Block of strength and endurance on ice-hockey players

- Team sports (and SOF) require high levels in several physical capacities
- Potential interference effect?
- During season: lower muscle volume and unchanged Aerobic cap
- Handball-study: pos effects, but did not control for intensity
- BP group (8) and TRAD (8), 6 weeks intervention. Equal volume

Rønnestad et al., 2018

Design

- BP: Week 1,3,4 and 6: Strength (6-7 sessions). One HIT session endurance per week to maintain. Week 2 and 5 HIT endurance training (5 sessions) , one whole-body strength session to maintain.
- TRAD:2-3 HIT endurance and 4-5 strength sessions per week.
- 42 sessions in total. Only difference in weekly organization.

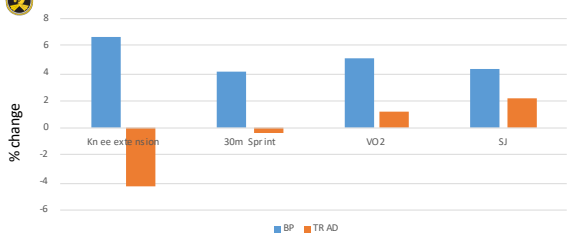
Rønnestad et al., 2018

6wk block periodization ice-hockey

	Block		Traditional	
Week	HIT	Strength/Plyo	HIT	Strength/plyo
1	1	7	2	5
2	5	1	3	4
3	1	6	2	5
4	1	7	2	5
5	5	1	3	4
6	1	6	2	5
TOTAL	14	28	14	28

Rønnestad et al., 2018

Results



Rønnestad et al., 2018

Blocking linear and non-linear models of strength and endurance among NORAVSOC-operators

Development and Implementation of a New Physical Training Concept in the Norwegian Navy Special Operations Command

Paul André Solberg,[1] Goran Paulsen,[1,2] Ole Gunnar Slaathaug,[1] Magnhild Skare,[1] Dallas Wood,[3] Shaun Huls,[3] and Truls Raastad[1,2]

2015

[1]Defence Institute; [2]Department of Physical Performance, Norwegian School of Sport Sciences, Oslo, Norway; [3]Virginia Beach, VA

- 6 months blocked linear periodization with pre and post
- 6 months blocked non-linear periodization with pre and post

0-6 months: Linear Periodization

- **Typical strength protocol:**
  - 10 reps x 3 (2 wk)
  - 5 reps x 4 (2 wk)
  - 5/3/1 (2 wk)
- **Aerobic protocol:**
  - Long runs/long intervals
  - Short-intervals
  - Sprints
- 2 individual sessions per week

Photo: Didrik Linnerud

Solberg et al., 2015

6-12 months: Non-linear periodization

Typical strength block (2 weeks)
- Day 1: 15-20 RM (circuit)
- Day 2: 5-6 RM
- Day 3: HIT Endurance (long-intervals)
- Day 4: 10-12 RM
- Day 5: 1-4 RM (olympic lifts)

Typical aerobic block (2 weeks)
- Day 1: Long runs
- Day 2: Short intervals
- Day 3: Strength (whole body)
- Day 4: Long-intervals
- Day 5: Sprints/shuffle

- 1-2 individual sessions per week
- Split-programs (2 UB and 2 LB/whole body)

Solberg et al., 2015

Typical “strength-week”

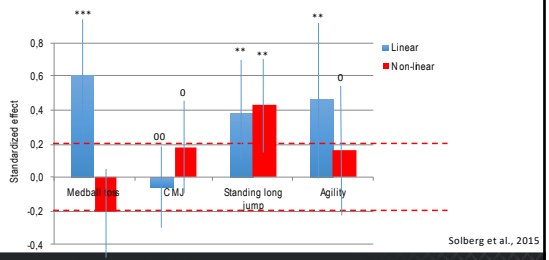
LB	UB (individual)	Endurance	LB	UB	Individual	REST

Typical “endurance-week”

Long-run	Short Intervals (individual)	Strength (8-12 whole body)	Long intervals	Sprints	Individual	REST

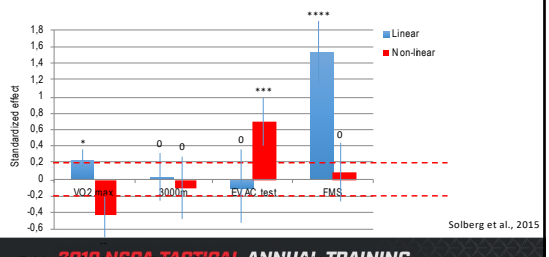
Solberg et al., 2015

Changes in Speed and Power



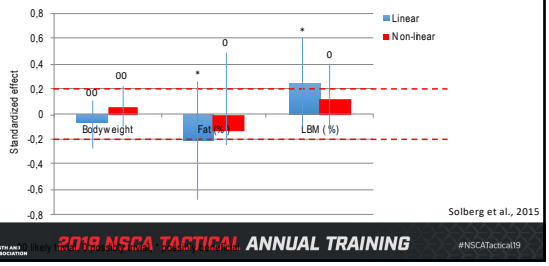
Solberg et al., 2015

Changes in Endurance and Flexibility



Solberg et al., 2015

Changes in Body Composition

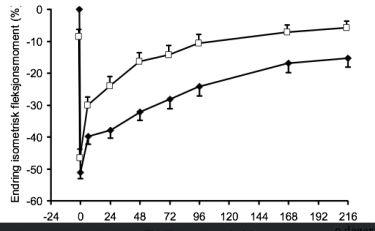


Solberg et al., 2015

Why does it work?

vs.

Or just a change?
- Repeated session effect



Paulsen et al 2010

Sum up – Block periodization

- Excellent results based well-trained, short intervention period
- Both neural and muscular adaptations inhibited in TRAD?

Sum up cont: Psychologically beneficial?

- Only one characteristic to focus on
  - Particularly important for SOF?
- Easy weeks (blocks)?

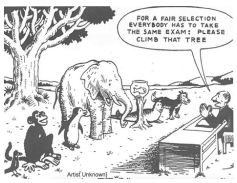
Beardsley, 2014

Possible challenges with block periodization

- Individual differences?
- Difficult to peak?
- Length of blocks?
- Length of residual-effect?
- Only for well-trained?

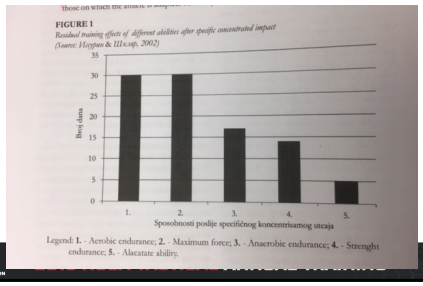
How to individualize?

- Huge variations in respons to training protocols
- Blocks based on testing?
- More frequent on important capacities?



Residual effects?

- Possible to take advantage or impossible to know?



Residual effects cont.?

Delayed myonuclear addition, myofiber hypertrophy, and increases in strength with high-frequency low-load blood flow restricted training to volitional failure

Thomas Bjørnsen,[1] Mathias Wernbom,[2] Arnstein Løvstad,[1] Gøran Paulsen,[3] Randall F. D'Souza,[1] David Cameron-Smith,[4,5] Alexander Flesche,[1] Jonny Hisdal,[6] Svein-Inge Bertelsen,[1] and Truls Raastad[1]

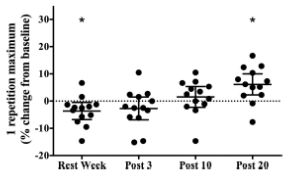


Fig. 5. Maximal strength. Relative change in 1 repetition maximum during the Rest Week as well as 3 (Post 3), 10 (Post 10), and 20 days (Post 20) after cessation of training; *$P < 0.05$. Data are reported as pooled means between the left and right leg and expressed as means ± SD.

Bjørnsen et al., 2019

Maintenance of («the other») one capacity

- Only goal is to maintain fitness level achieved in the previous phase
  - What is the minimum amount of training?
  - Is one HIIT session per week enough?
  - The more fit, the more difficult to maintain (need more training?)
  - High volume of endurance training inhibits adaptions? (Kraemer et al., 1995)
- Morehouse (1967): strength gains can be maintained by one strength session every other week during 8 weeks in college aged men
- Kramer et et al., 2004: Two strength session per week in season reduced strength, jump height and sprint performance during an 11-week soccer season → overtraining?

In season strength maintenance training frequency in professional soccer players

- 10 weeks preparatory training
  - Increased strength (19%), jump height (3.3%) and 40m sprint (1.8%).
- 2 groups:
  - 1 strength session per week
  - 1 strength session every other week
- Only weekly session maintained improvements gains during the first 12 weeks of season
- One session every other week reduced leg-strength (10%) and 40 m performance (1.1%)

Rønnestad et al., 2011

Critique

Koprivica (2012):

- Criticism of traditional periodization (linear) is not well founded
  - Subjective
- Block periodization builds on residual effects, but is that true or similar for all?

Kiely (2012):

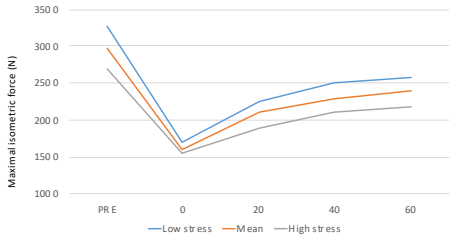
- «One best way» to organize training? Probably not!
- Is block-periodization a superior periodization protocol, or is it superior because of the sudden variation to habituative training?
  - probably the last
- The complexity of planning tasks are reduced through the assembly of superficially logical set of assumptions, rules and guidelines
  - dangerous when such simplifications are enshrined in practice

Critique continue...

Kiely (2018):

- Life stress associated with sports-related injuries and related to negative performance and training outcomes
- Do we consider the psycho-emotional factors (RPE/PRS) when we periodize our training?
  - Directly linked to training outcomes, but we often only consider biological and physiological factors
- «The claim that a universally best periodization framework exists, however, is only suitable if humans respond to imposed training stress along predictable trajectories, in generalized timeframes, and conforming to predictable dose/response relationships» (p.759)

Life stress impairs muscle recovery



Stults-Kolehmainen et al., 2012

...Remember that huge changes/splash in the water can cause unwanted outcomes....

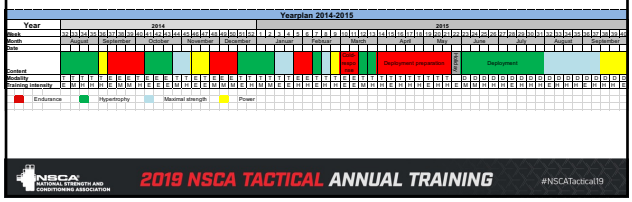
... Hence, you should monitor the individual responses to the change....

How to put it all together....

- 2-6 week blocks
- Endurance when travelling
  - And before altitude training
- Strength when on base/in house
- Easy weeks around exercises (during or after)
- Hard block up to exercise (self-confidence)
- Power before/during Close Combat training

Programming

- Block´s adapted to work-schedule
  - "Prep" before work
  - Continuous development
- Individual blocks! (When possible)



Acknowledgements

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